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tendon pass to the third and fourth toes, some of the fibres go to the second toe, while few, if any, are sent to the fifth.)

But occasionally this muscle inserts entirely into the tendon of the *M. flexor longus hallucis*. The significance of this condition will be apparent when we examine the arrangement of the parts in the cat. But first let us take a glance at anthropoid anatomy. Among the apes the flexor accessorius is wanting. The flexor longus hallucis, instead of the flexor longus digitorum pedis, supplies the perforating tendons for the third and fourth toes, and in *Hylobates*, for even the second phalanx as well. In this way it helps out the latter muscle, which supplies, in these cases, only the second and the fifth phalanges, or only the fifth phalanx, while the hallux receives usually only a slender tendon, which, according to Bischoff, is entirely absent in the orang. This muscle (fl. accessorius) seems to be a portion of the primitive *M. flexor fibularis*, which has given rise to the two muscles, flexor long. hallucis and flexor long. digit. pedis. The accessory portion is not split off in the apes,—it is, in the case of man as well as in the cat, and here its point of origin has grown distad until all connection with the leg has been lost, except in those infrequent cases where it still passes up over the median face of the calcaneum into the region of the leg. In both man and the cat it strengthens the action of the two combined flexors of the digits, and by its lateral pull gives a different direction to their action. Innervation through *N. plantaris lateralis* (external plantar).

In *Felis* the accessorius is both less strongly developed and more transverse to the foot axis, in its course, than in man, and it is frequently entirely fibrous without any muscular tissue, *i. e.*, reduced to a mere ligament. When well developed it forms a small flattened plate which arises from the inferior portion of the external faces of the calcaneum and cuboid, from whence it passes inwards and downwards, posterior to the fused tendons of the *Mm. flexor longus digitorum pedis* and *flexor longus hallucis* to near where they fuse, at which place it inserts into the internal border of the tendon of the flexor long. hallucis. Usually the insertion is not confined to the internal border of this tendon but involves a greater portion of the broad tendinous plate formed by the fusion of the tendons of the two digital flexors above named. The fusion of their tendons practically makes a single muscle out of these two toe flexors. This is equally true of man. This fact helps to explain the varying insertion in man from a mechanical standpoint.

Briefly summarized.—The accessorius in man usually presents a muscular body, which, however, may be absent, while in the cat it is often absent and normally of much feebler development than in man. In the human subject the insertion is usually into the external border of the flexor longus digitorum pedis, though it may be entirely into that of the flexor longus hallucis, while in the cat the usual and best developed insertion is into the tendon of the latter muscle.

In conclusion, the muscle is an old friend, both in cat and man.

HOWARD AYRES.

The Lake Laboratory, Milwaukee, Aug. 24, 1893.

DAMAGE TO COTTON BY LIGHTNING.

On July 26, 1893, during a thunder storm there was one heavy report noticed in the direction of some cotton plats. The bolt seemed to have "struck" near the plats. The next day a spot in the midst of the plats was found where the most succulent parts of the plants were wilting. Examination showed no visible injury as the cause.

There had previously been no sign of blight or disease, whatever, which could have caused the cotton to droop.

The rows run north and south, and five were affected; three for nearly a rod, the one on the east half that distance, and the fifth on the west very little, only two or three of the tallest plants being affected.

By common consent of those who saw the cotton it was agreed to be the work of the thunderbolt, and was so noted. No place where violence was done could be found in the soil.

Frequent observation during the first month has failed to see any increase in the blasted circle. In the whole space twenty-five or thirty plants have died, while others have low branches thriving and bearing fruit and flowers. If a fungus has done it some plants have *resisted* in part and succumbed in part, or the fungus has but partially done its work.

My notion of a discharge from an electrified cloud is that the interchange between it and the earth charged with the opposite pole is carried on by every leaf and point not repellant to the fluid; that if any plant from a tender annual up get more of the electric fluid than it can safely carry it will be injured according to the strength of the overcharge, even to total destruction, involving appearance of great physical violence, if the charge is heavy; and that the discharges take the line of least resistance, according to the common explanation of the zigzag course of lightning.

If this notion of lightning discharges is correct, is not the supposition that this particular occurrence is due to lightning based on tenable ground? Might not a bolt of lightning descend obliquely from one side or other, and when near the earth be deflected upward, but yet come near enough to the ground to destroy the life in the tallest of those plants while not destroying the low laterals of the shorter plants? Or may not this discharge be considered as having entered the earth through those plants with the observed effect to destroy so many of the first conductors—the tallest ones—and nearly all of the others nearest at hand; while of those furthest out only the highest points were harmed? FRANK E. EMERY.

Raleigh, N. C., Aug. 26.

ON SOME NESTING HABITS OF THE AMERICAN GOLDFINCH.

It is probably a truth that every ornithologist has some bird which is his particular care to study; and being myself no exception to the rule, I thought perhaps a few notes on the nesting habits of the American Goldfinch, observed while collecting a large series of their nests and eggs, might be acceptable to the readers of *Science*.

Although found in southern Michigan throughout the winter in scattered flocks, it delays nesting until the latter part of July or the first of August. On studying the nests of the Goldfinch all will be found to be at least slightly different, yet there seem to be two distinct patterns in their architecture. The first and most common form is massively built and forms a thick cushioned receptacle for the eggs. An example of this class, which I have before me, has walls about an inch thick, while the distance to the bottom of the crotch in which it is situated is about three inches. The whole mass is composed of very fine fibres and thistle-down; and as this pattern of nest is usually situated where the twigs are thickest, it may easily be seen what a useful purpose it serves in deadening the force of a sudden blow or jar, which might otherwise result disastrously to the eggs. A two-storied nest of this kind I found in a blackberry bush on August 3. The lower

nest containing a Cow-bunting's egg, over which was built another nest containing six eggs of the Goldfinch.

In the nest of the second form the walls are much thinner, and the general form and structure much resemble a Vireo's nest. These beautiful frail structures, however, are much better adapted to their position on the ends of branches than the thick nests would be if placed in that position.

The eggs are from three to six in number, most commonly five, blue, unspotted, save in the instance of two sets evidently belonging to the same pair of birds, which I found, one set in 1890, the other in '91, in the same tree. The eggs were finely spotted with reddish brown forming a wreath around the larger end. I have never heretofore seen an instance of spotted eggs of the Goldfinch noted in ornithological publications, and I believe their occurrence is somewhat uncommon.

PAUL VAN RIPER.

PHYSICAL CHEMISTRY AT THE COLUMBIAN CONGRESS.

THE recent doctrines of chemical energy are pushing towards the front. The opening paper on physical chemistry was presented to the Congress by the writer of this report, who called attention to the valuable results arising from "the cross-fertilization of the sciences." The physical properties of substances have long been studied, under the name of chemical physics; such data are indispensable in chemical analysis, technology, etc. But, with transposition of the terms, we find more attention given to the properties of energy itself, and to the conditions of equilibrium, and of rapid or slow change. These generalizations promise to be most fruitful of results, and deserving of general recognition in our universities.

The second paper, "on chemical energy," was contributed by Professor Ostwald, of Leipsic, who is indefatigable, both in research and in expounding the progress of science. The two factors, capacity and intensity, are discussed and illustrated in this paper, with great perspicuity. Capacity is proportional to the mass; for two tons of coal, by combustion, will yield twice as much heat as one ton. To estimate the intensity, on the other hand, we may remember that heat conduction always implies some difference in heat intensity; so, a chemical transformation implies greater intensity of chemical energy in the reacting bodies than in the reaction products, under comparable conditions. A "chemometer" analogous to thermometer, though not yet complete, is not wholly unknown. Emphasis is given to the theorem, "two potentials which individually are equal to a third are equal to each other," with important deductions therefrom; and catalytic bodies are discussed in relation to the acceleration of chemical change.

A third paper, by Prof. J. E. Trevor, of Ithaca, states the fundamental equations of equilibrium, for three leading cases, and presents some extended mathematical deductions.

Three other communications, assigned to this section, are of more varied character. Prof. E. W. Morley stated by request some of his results in determining the atomic weight of oxygen, with remarkably close agreement, at about 15.88; but the work is still in progress.

Professor Lunge, of Zurich (whose genial presence added much to the interest of the Congress) described apparatus for promoting the interaction of liquids and gases. Perforated earthenware plates, of special form, are so placed as to promote contact of the reacting substances,—as in sulphuric acid manufacture.

Prof. T. H. Norton communicated a paper from Professor Orndorff, illustrating by models the stereochemistry of paraldehyde and metaldehyde (C_2H_4)₃. The three methyl groups are assumed in one case to be all on one

side of the plane of the carbon-oxygen ring; and in the other case to be distributed on both sides.

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GREAT HORNED OWLS IN CONFINEMENT.

WHILE collecting in some dense pine woods early in April, 1886, I saw a great horned owl about every day which flew from a nest in a pine tree. This tree was the tallest of its kind in the vicinity, and the nest was at least seventy-five feet from the ground. Thinking I might secure its eggs or young, I climbed the tree and found, much to my disgust, that the bird used the nest only as a roosting place.

By patient watching and hunting I discovered its nest April 19, in a large chestnut tree. It was composed of coarse sticks and was lined with feathers and down from the parent bird, and had the appearance of having been a deserted hawk's nest.

Here I found two young birds which were covered with down and were about half grown. Their tail and wing feathers were just starting out. They tried to defend themselves like an adult bird by keeping up a continual hissing and blowing sound, and at the same time snapping their bills and opening and closing their eyes. I noticed that they occasionally made a low, murmuring sound, and also a louder and harsher note, which they make now when hungry.

In the nest with them were two half-eaten fish, *Catostomus communis*, and the hinder portion of two brown rats. When in confinement, a week or two later, they ate voraciously, and one day I offered one a dead mourning dove. It seized it head first, and in a very few minutes succeeded in swallowing it entire, except the tips of its tail feathers, which protruded from its mouth. I expected then it would fall a victim to its gluttony, but within a very short time the tail feathers had disappeared, and it remained very quiet for two or three hours, after that it showed no discomfort whatever from its meal.

April 27 they could walk quite well, and about June 15 the feathers started out on the head of the smaller bird, which I believe to be a male, although it was by far the larger when taken from the nest.

The feathers on the larger, or female bird, did not appear until July 4, and at this date the wing and the tail feathers on both were full grown. After this time they consumed but a small portion of the food they formerly did, although they occasionally ate voraciously. They seem to prefer rats, mice, birds and are quite partial to beef.

About the middle of October the larger, and what I believe to be the female bird, began to hoot, but not very loud. This is performed by the bird standing at its full height, with its ear-tufts (which were fully developed October 1) erect, but slightly slanting backward, and swelling out its throat it gives utterance to the notes, "waugh ho ho ho ho."

They recognize all strangers, and appear afraid of dogs, horses and cows, but always show fight and act on the defensive. Their way of showing fight is to lower their head and tail, and spread their wings to nearly their full extent, but arching them so as to protect their body, and at the same time utter a peculiar blowing or hissing sound, accompanied with a snapping of their bills.

They have been confined in a large cage for over seven years, and during this time have showed no inclination to breed, and when not disturbed have made no attempts to escape, but sit quietly on their perches through the day. Just after dark they move about considerably.